WE CLAIM:

1. A method of embedding data in material, the method comprising the steps of:

producing transform coefficients Ci representing a transform of the material, and

combining the coefficients Ci with data symbols Ri to produce modified coefficients Ci' where

$Ci' = Ci + \alpha i \, Ri$

the method further comprising determining αi for each unmodified coefficient Ci as a function $F\{Cn\}_i$ of a predetermined set $\{Cn\}_i$ of transform coefficients Cn which set excludes the coefficient Ci wherein the coefficients are serially ordered and the coefficients Cn are coefficients preceding coefficient Ci.

2. A method according to claim 1 wherein the coefficients of the set $\{Cn\}_i$ vary with i.

3. A method according to claim 1, wherein the number Ni of coefficients in the set {Cn}i varies with i.

4. A method according to claim 1, wherein the coefficients of the set $\{Cn\}_i$ have a predetermined positional relationship with the coefficient Ci to be modified.

5. A method according to claim 1, wherein the coefficients represent a spatial frequency transform of the material.

6. A method according to claim 1, wherein the coefficients represent a wavelet transform of the material.

7. A method according to claim 6, wherein the transform produces coefficients Ci in a plurality of bands.

8. A method according to claim 7, wherein the transform coefficients forming the set $\{Cn\}_i$ are all in the same band.

9. A method according to claim 7, wherein the transform coefficients forming the set $\{Cn\}_i$ are in a plurality of bands.

10. A method according to claim 1, wherein the said function $F\{Cn\}_i$ is such that

$\alpha i = \frac{1}{Ni}.\sqrt{\sum C_n^2}$ for $n = i\text{-}1$ to $i\text{-}N_i$ *for* $N_i \neq 0$ and $\alpha i = k$ for $N_i = 0$

where Ni is the number of coefficients Cn in set i.

11. A method according to claim 1, wherein the said data symbols Ri are of a pseudo random symbol sequence having symbols Pi modulated by data Wj to be embedded.

12. Apparatus for embedding data in material, comprising

a transformer for producing transform coefficients Ci representing a transform of the material, and

a combiner for combining the coefficients Ci with data symbols Ri to produce modified coefficients Ci' where

$Ci' = Ci + \alpha i\ Ri$

the apparatus further comprising

a calculator for calculating αi for each unmodified coefficient Ci as a function $F\{Cn\}_i$ of a predetermined set $\{Cn\}_i$ of transform coefficients Cn which set excludes the coefficient Ci, wherein the coefficients are serially ordered and the coefficients Cn are coefficients preceding coefficient Ci.

13. Apparatus according to claim 12, wherein the coefficients of the set $\{Cn\}_i$ vary with i.

14. Apparatus according to claim 12, wherein the unmodified coefficients of the set $\{Cn\}_i$ have a predetermined positional relationship with the coefficient Ci to be modified.

15. Apparatus according to claim 12, wherein the coefficients represent a spatial frequency transform of the material.

16. Apparatus according to claim 12, wherein the coefficients represent a wavelet transform of the material

17. Apparatus according to claim 16, wherein the transformer produces coefficients Ci in a plurality of frequency bands.

18. Apparatus according to claim 17, wherein the transform coefficients forming the set $\{Cn\}_i$ are all in the same band.

19. Apparatus according to claim 18, wherein the transform coefficients forming the set $\{Cn\}_i$ are in a plurality of bands.

20. Apparatus according to claim 12, wherein the said function $F\{Cn\}_i$ is such that

$\alpha i = \frac{1}{N_i} \cdot \sqrt{\sum C_n^2}$ for $n = i\text{-}1$ to $i\text{-}N_i$ for $N_i \neq 0$ *and* $\alpha i = k$ for $N_i = 0$

where Ni is the number of coefficients Cn in set i.

21. A method or apparatus according to claim 1, wherein the data is imperceptibly embedded in the other material.

22. A method or apparatus according to claim 1, wherein the set {Cn}i consists of unmodified coefficients.

23. A method or apparatus according to claim 1, wherein the set $\{Cn\}_i$ consists of modified coefficients preceding Ci where the coefficients are serially ordered.

24. A method or apparatus according to claim 1, wherein the set $\{Cn\}_i$ comprises at least one modified coefficient and at least one unmodified coefficient.

25. A method of removing data embedded in material according to the method of claim 1, the detecting method comprising:

determining the values of the data symbols Ri;

calculating, for each modified coefficient Ci', the value of the said function $F\{Cn\}_i$ of the corresponding set $\{Cn\}_i$ of coefficients Cn to determine αi; and

for each modified coefficient Ci', subtracting therefrom $\alpha i.Ri$ to restore the unmodified coefficient value Ci, wherein the coefficients are serially ordered and the said set {Cn}i consists of modified coefficients preceding coefficient Ci.

26. A method according to claim 25, wherein the said set {Cn}i consists of restored coefficients Ci and comprising the further step of using a restored coefficient Ci as a coefficient of another set {Cn}j of coefficients for restoring another coefficient Cj.

27. Apparatus according to claim 25, wherein the said set {Cn}i comprises at least one modified coefficient and at least one restored coefficient, the coefficients preceding C'i.

28. A method according to claim 25, wherein the step of determining the values of the data bits Wj embedded in material according to the method of claim 11,

comprises correlating a reference pseudo random symbol sequence with the modified coefficients Ci' and decoding the correlation values to determine the data Wj modulating the pseudo random sequence and remodulating the reference sequence with the said data to restore Ri.

29. Apparatus for removing data embedded in material according to the method of claim 1, the apparatus comprising:

a processor for determining the values of the symbols Ri;

a calculator for calculating, for each modified coefficient Ci', the value of the said function $F\{Cn\}_i$ of the corresponding set $\{Cn\}_i$ of coefficients Cn to determine αi; and

a subtractor which, for each modified coefficient Ci', subtracts therefrom $\alpha i.Ri$ to restore the unmodified coefficient value Ci, which thereby becomes available for use as an unmodified coefficient of another set $\{Cn\}_i$ of unmodified coefficients Cn for restoring another coefficient Ci', wherein the coefficients are serially ordered and the said set {Cn}i consists of coefficients preceding coefficient Ci.

30. Apparatus according to claim 29, wherein the said set {Cn}i consists of restored coefficients Ci and comprising the further step of using a restored coefficient Ci as a coefficient of another set {Cn}i+1 of coefficients for restoring another coefficient Ci+1.

31. Apparatus according to claim 30, wherein the said set {Cn}i consists of modified coefficients preceding coefficient Ci.

32. Apparatus according to claim 30, wherein the said set {Cn}i comprises at least one modified coefficient and at least one restored coefficient, the coefficients preceding C'i.

33. Apparatus according to claim 29, wherein the means for determining the values of the data bits Wj embedded in the material according to the method of

claim 12, comprises a correlator for correlating a reference pseudo random symbol sequence with the modified coefficients Ci', a decoder for decoding the correlations to determine the data Wj modulating the modulated sequence and a modulator for remodulating the reference sequence with the said data to restore Ri.

34. A computer program product arranged to carry out the method of claim 1 when run on a computer.

35. A computer program product arranged to carry out the method of claim 25 when run on a computer.

36. A method or apparatus according to claim 1, wherein the material is video material.

37. A method or apparatus according to claim 1, wherein the material is audio material.

38. A method or apparatus according to claim 1, wherein the material is audio/visual material.

39. A method comprising the steps of:

embedding data in first material to produce second material in which the data is embedded;

removing the data from the second material to produce recovered material;

comparing the first and recovered material to determine any differences and locations of differences therebetween; and

storing corrections which correct the said differences and data identifying the said locations in the first material at which the differences occur.

40. A method according to claim 39, further comprising applying a channel emulation to the second material, wherein the removing step produces recovered material from the second material to which the emulation function has been applied.

41. A method according to claim 39, wherein the storing step comprises storing, as the said corrections, the values of the first material which values occur at the said locations in the first material.

42. A method according to claim 39, wherein the storing step comprises storing the said differences.

43. A method according to claim 39, further comprising storing identification data which identifies the said material.

44. A method according to claim 39, wherein the said identification data comprises an identifier which identifies the second material.

45. A method of removing data embedded in material, the data being embedded in the material according to the method of claim 39, the removing method comprising the steps of:

removing the data from the said second material to produce recovered material;

retrieving the said corrections and locations from a store storing the said corrections which correct the said differences and the said data identifying the said locations in the first material at which the differences occur; and

using the said retrieved corrections to correct the recovered material at the said locations identified by the identifying data.

46. A method according to claim 44, further comprising applying a channel emulation to the second material, wherein the removing step produces recovered material from the second material to which the emulation function has been applied and wherein the using step comprises replacing the values of the recovered material at

the said locations identified by the identifying data by the stored values of the first material at the said locations.

47. A method according to claim 45, wherein the storing step comprises storing the said differences and the using step comprises correcting the values of the recovered material at the said locations using the said stored differences.

48. A method according to claim 45, further comprising storing identification data which identifies the said material and the step of determining the identifier of the second material and retrieving from the said store the corrections and locations associated with the identified material.

49. Apparatus comprising:

an embedder for embedding data in first material to produce second material in which data is embedded;

a remover for removing the data from the second material to produce recovered material;

a comparator for comparing the first and recovered material to determine the differences, and locations of differences, therebetween; and

a store for storing data identifying the said locations and corrections which correct the said differences.

50. Apparatus according to claim 49, further comprising a channel emulator between the embedder and remover.

51. Apparatus for removing data from material in which the data has been embedded by the apparatus of claim 49, the removing apparatus comprising:

a remover for removing the data from the said second material to produce recovered material;

a deriver for deriving the said corrections and identifying data from the said store; and

a corrector arranged to use the stored corrections to correct the recovered material at the said locations identified by the identifying data.

52. A system comprising embedding apparatus according to claim 49, and removing apparatus according to claim 51 linked by a channel.

53. A method according to 39, wherein the said material is video material.

54. A method according to claim 39, wherein the said material is audio material.

55. A method according to claim 39, wherein the said material is audio-visual material

56. A method according to claim 39, wherein the said data includes a UMID.

57. A computer program product arranged to carry out the method of claim 39 when run on a computer.

58. A computer program product arranged to carry out the method of claim 45 when run on a computer.